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## Seeking clarity on retinal findings in patients with COVID-19

We read with enthusiasm about retinal changes in patients with COVID-19 symptoms, reported by Paula M Marinho and colleagues.<sup>1</sup> The COVID-19 pandemic is a global health emergency challenging citizens, health authorities, and scientists.<sup>2</sup> The academic response to the pandemic has been amazing. However, many questions remain unanswered.

The prospect of characterising retinal changes in patients with COVID-19 is promising. Retinal changes have been reported for other emerging viral disorders, including chikungunya, dengue fever, Zika, Ebola virus disease, and yellow fever, among others.<sup>3</sup> Some of these retinal changes might even serve as non-invasive biomarkers of systemic disease, similar to what has been shown for yellow fever.<sup>4</sup>

Careful interpretation of novel imaging observations is essential in this context. In addition to micro-angiopathic changes (indicated by retinal cotton wool spots and microhaemorrhages), which are also seen in other viral conditions,<sup>3,4</sup> Marinho and colleagues<sup>1</sup> report hyper-reflective lesions on optical coherence tomography at the level of the retinal ganglion cell and inner plexiform layers. After carefully analysing these images, we argue that these changes represent oblique sections and cross-sections of perifoveal retinal blood vessels.

Our arguments are two-fold. First, these images show the exact location of the perifoveal vascular plexus, which is found in normal retina.<sup>5</sup> Second, the underlying shadowing is consistent with opaque structures such as retinal blood vessels (appendix). Because Marinho and colleagues<sup>1</sup> did not display corresponding near-infrared images, topographical correlation, as we show in the appendix, could not be seen. However, we congratulate the authors on their work and hope that some of

their observations are reproduced and further validated in future studies.

CB-d-R, AD-F, and DVV-S are co-founders and partners of Alsculapius Intelligent Medicine.

*Camilo Brandão-de-Resende,*  
*Alberto Diniz-Filho,*  
*\*Daniel V Vasconcelos-Santos*  
**dvitor@ufmg.br**

Uveitis Unit (CB-d-R, DVV-S) and Glaucoma Unit (CB-d-R, AD-F), Hospital São Geraldo-Hospital das Clínicas da Universidade Federal de Minas Gerais, Belo Horizonte 30130-100, Brazil; and Departamento de Oftalmologia e Otorrinolaringologia (CB-d-R, AD-F, DVV-S) and Programa de Pós-Graduação em Ciências da Saúde Infectologia e Medicina Tropical (CB-d-R, DVV-S), Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

- 1 Marinho PM, Marcos AAA, Romano AC, Nascimento H, Belfort Jr R. Retinal findings in patients with COVID-19. *Lancet* 2020; **395**: 1610.
- 2 Lippi G, Sanchis-Gomar F, Henry BM. Coronavirus disease 2019 (COVID-19): the portrait of a perfect storm. *Ann Transl Med* 2020; **8**: 497.
- 3 Oliver GF, Carr JM, Smith JR. Emerging infectious uveitis: chikungunya, dengue, Zika and Ebola: a review. *Clin Exp Ophthalmol* 2019; **47**: 372–380.
- 4 Brandão-de-Resende C, Cunha LHM, Oliveira SL, et al. Characterization of retinopathy among patients with yellow fever during 2 outbreaks in southeastern Brazil. *JAMA Ophthalmol* 2019; **137**: 996–1002.
- 5 Hogan MJ, Alvarado JA, Weddell JE. Histology of the human eye. Philadelphia, PA: WB Saunders, 1971.

See Online for appendix

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